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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,212	03/31/2004	Daoqiang Lu	INTEL8 (P17774)	6013
6980	7590	08/12/2005	EXAMINER	
TROUTMAN SANDERS LLP BANK OF AMERICA PLAZA, SUITE 5200 600 PEACHTREE STREET, NE ATLANTA, GA 30308-2216			CLARK, JASMINE JHIHAN B	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 08/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

HA

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/814,212	LU, DAOQIANG	
	<b>Examiner</b>	<b>Art Unit</b>	
	Jasmine J. Clark	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 July 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27-35 is/are allowed.
- 6) ☒ Claim(s) 1-3, 7, 10, 11, 13, 22 and 25 is/are rejected.
- 7) ☒ Claim(s) 5, 6, 8, 9, 12, 14-20, 24 and 26 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)     | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

1. The indicated allowability of claims 2,4-6,8,9,11,12,14-21, and 24-26 is withdrawn in view of the newly discovered reference(s) to Vrtis et al. (US 6,751,099 B2). Rejections based on the newly cited reference(s) follow.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 7,10,11,13, 22, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vrtis et al. (US 6,751,099 B2) in view of Wang et al. (US 6,909,176 B1).

Vrtis discloses a device comprising a heat spreader 30 (see column 1, line 55, and see Fig. 2); a semiconductor die 15; and a thermal liquid phase (TIM) 45 of SnBi (see column 3, line 4) disposed between the heat spreader 30 and the die, whereas the metallurgies, such as SnBi is capable of forming a transient liquid phase bond such that the metal form an eutectic alloy. However, Vrtis fails to disclose that the die 15 is made of silicon. Wang teaches the use of silicon die where a thermal interface material 110 attached between the silicon die 102 and heat spreader 112 (see claim 1 for example).

Hence, it would have been obvious to employ the silicon chip/die, because it is widely used in a semiconductor industry.

Concerning claim 7, wherein the heat spreader comprises a metal selected from the group consisting of, for example copper, please see claim 2 of Vrtis (US 6,751,099 B2).

Concerning claims 10 and 11, wherein the TIM is comprised of a first metal selected from the group consisting of, for example: tin (Sn) and a second metal is, eg., bismuth Bi, please see the above discussion.

Concerning claim 13, A process comprising:

attaching a silicon die to a substrate; depositing a thermal interface material on at least one of the silicon die and a heat spreader, and attaching the heat spreader to the silicon die, wherein the thermal interface material comprises a plurality of metals capable of forming a transient liquid phase bond, the bond being a eutectic alloy comprising the metals, please see the above discussion under claims 1-3, 7, 10 and 11.

Concerning claim 22, An apparatus comprising: a heat spreader; a substrate; a silicon die attached to the substrate; and a bonding material that bonds the heat spreader to the silicon die; wherein the bonding material comprises metal capable of forming a transient liquid phase bond, (please see the above discussion).

Initially, and with respect to claim 22 "wherein the bonding material is formed at a temperature lower than the melting point of the metals."; note that a "product by process" claim is directed to the product per se, no matter how actually made. See *In re Thorpe et al.*, 227 USPQ 964 (CAFC, 1985) and the related case law cited therein which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here,

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an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that the Applicants have burden of proof in such cases as the above case law makes clear.

Concerning claim 25, wherein the bonding material comprises tin(Sn) and bismuth (Bi), please see the above discussion.

***Allowable Subject Matter***

3. Claims 5, 6, 8, 9, 12, 14-20, 24, and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The applied reference fails to teach and/or suggest the limitations as set forth in claims 5, 6, 8, 9, 12, 14-20, 24 and 26.

4. Claims 27-35 are allowed.

The following is an examiner's statement of reasons for allowance: the applied reference fails to teach and/or suggest, for example, bonding the heat spreader to the silicon die, wherein the first and second metals form a transient liquid phase bond when heated for a predetermined time at a predetermined bonding temperature, wherein the bonding temperature is less than the melting temperature of the first and second metals.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

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accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Telephone Inquiry Contacts***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jasmine J. Clark whose telephone number is (571) 272-1726. The examiner can normally be reached on Flex.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jjbc/07/25/05

**JASMINE CLARK  
PRIMARY EXAMINER**

